CITY OF PORTSMOUTH TIDAL MARSH INVENTORY

Special Report No. 299 in Applied Marine Science and Ocean Engineering

Gene M. Silberhorn and Sharon Dewing

VIRGINIA INSTITUTE OF MARINE SCIENCE
SCHOOL OF MARINE SCIENCE
THE COLLEGE OF WILLIAM AND MARY
Gloucester Point, Virginia 23062

JULY 1989

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Dr. Frank O. Perkins, Dean/Director

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Preface

This publication is one of a series of county and city tidal marsh inventories prepared by the Wetlands Advisory Group of the Virginia Institute of Marine Science. The previously published reports include:

Lancaster County
Northumberland County
Mathews County
York County and the Town of Poquoson
Stafford County
Prince William County
King George County
City of Hampton
Fairfax County
Gloucester County
City of Virginia Beach Vol. 1 and 2
City of Newport News and Fort Eustis
Accomack County
Northampton County
Westmoreland County
James City County and the City of Williamsburg
Surry County
Spotsylvania and Caroline Counties and the City of Fredericksburg
New Kent County
Essex County
Isle of Wight County
Middlesex County
City of Norfolk
King William County and Town of West Point
King and Queen County
Prince George County and City of Hopewell

Under Section 62-1.13.4 of the Virginia Wetlands Act, the Virginia Institute of Marine Science is obligated to inventory the tidal wetlands of the Commonwealth. This inventory program is designed to aid the local wetlands boards, the state and federal regulatory agencies, and regional planning districts in making informed rational decisions on the uses of these valuable resources. They are also intended for use by the general public as a natural history guide and the scientific community as a research data source.

The reader is referred to the Shoreline Situation Report, Cities of Chesapeake, Norfolk and Portsmouth, D. W. Owen, L. M. Rogers, and M. H. Peoples, 1976, SRAMSOE No. 136, Virginia Institute of Marine Science, Gloucester Point, Virginia 23062. This report focuses on various shoreline characteristics including areas of erosion and accretion, beaches, marshes, artificially stabilized areas, and fastland types and uses.

Also of interest may be a booklet, Wetlands Guidelines, available from the Marine Resources Commission, Newport News, Virginia, which describes the wetlands types and the types of shoreline activities which affect wetlands and what these effects are.

Acknowledgements

First among the individuals that we owe thanks are Arthur Harris and James Perry for their invaluable assistance in the field and help in data reduction. We also thank Judy Hudgins and Walter Priest, III for reviewing and editing the manuscript. We are also indebted to Dianne Bowers for map illustrations and Harold Burrell and William Jenkins for cover design and photographic reproduction. We greatly appreciate the talents of Janet Walker for text processing and table production, and Sylvia Motley for printing.

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Introduction

The tidal wetlands within the City of Portsmouth have been historically subjected to widespread development pressures, as have the wetlands in other Hampton Roads metropolitan areas. Since the turn of the century, a number of tidal wetland creeks have been lost mainly through filling promoted by urban, industrial, and military reservation expansion. Based on archival information (Map of Hampton Roads, U.S. Geodetic Survey, 1894), the City has lost hundreds of acres of tidal marshes over the last 95 years. Partial and entire tributaries of the Western and Southern Branches of the Elizabeth have been lost with barely a trace. Losses are also evident as recent as the 1980's based on aerial photography interpretation and field work done by wetlands personnel at VIMS. Against this background, the remaining 422 acres of tidal wetlands represent a valuable resource well worth the management program currently protecting them.

The value of these areas to wildlife, fishes, water quality and the ecological integrity in general is many faceted. Wetlands offer a significant contribution to the estuarine foodweb by virtue of the organic matter (detritus) produced and exported to adjacent waters. Marshes provide important nursery areas for the juveniles of many commercially important finfish and shellfish, as well as feeding areas for numerous forage fishes. The habitat that they provide for waterfowl, wading birds, shorebirds, song birds and small mammals is vitally important, especially in a highly urbanized environment. Their role as a filter for upland runoff and as a center of nutrient cycling is again particularly important in the intensely developed setting where upland inputs of nutrients and various pollutants can have a significant impact on adjacent water quality. Tidal marshes can also provide an effective buffer against shoreline erosion by binding sediments and dissipating wave energy. These same areas can effectively mitigate the impacts of coastal flooding by absorbing floodwaters and buffering flood depths.

Most of the marshes in the City are found along the tributaries of larger systems such as the James River (Hampton Roads) and the Western and Southern Branches of the Elizabeth River. The largest marsh complex in the City is located along Hoffler Creek near the Corps of Engineers's Craney Island Dredged Disposal Area. The marshes of this creek system total 97.5 acres and are dominated by saltmarsh cordgrass (*Spartina alterniflora*). Saltmarsh cordgrass is considered to be one of the most important species in coastal wetlands, contributing greatly to the estuarine food web. Craney Island Creek also supports a significant amount of marsh with nearly 67 acres. Saltmarsh cordgrass also dominates in this system, but nearly one third of the marsh area is vegetated by reed grass (*Phragmites australis*), an aggressive, less desirable species that typically invades disturbed marshes.

Urban wetlands, such as the Portsmouth marshes, are a habitiat for a surprising variety of wildlife species. A number of water birds were observed during inventory field operations. Yellow Crown, Little Green and Great Blue Herons were particularly plentiful. Tidal wetlands often offer the city dweller an opportunity to observe wildlife that would normally only be seen in the country or a refuge.

Methods

Aerial photographs and topographic maps (U.S.G.S.) were utilized to determine wetland locations, wetland boundaries and patterns of marsh vegetation. Acreages and wetland boundaries were substantiated by observations on foot, by boat and by low level overflights. Individual plant species percentages are quantitative estimates of coverage based on visual field inspections of every marsh. In some instances, especially in tidal freshwater areas, those percentages are subject to seasonal bias.

Much of the field work for the City of Portsmouth was done in the summer of 1978. Subsequent field work and aerial photograph interpretation was done in the summer of 1988.

Marshes one quarter of an acre or larger are designated by number. Many marshes smaller than one quarter acre (usually narrow fringing marshes) are designated by the same symbol (color) as the larger marshes on the section maps but assigned no number. Small marshes (less than one acre) are exaggerated and are not indicated to scale. Information such as individual marsh acreage, plant species percentage and acreage, marsh type, and other observations are recorded in tabular form. Plant species percentages are recorded to the nearest percent, and acreages to the nearest tenth of an acre. In marshes of less than one acre, the areas are recorded to the nearest hundredth of an acre. In those instances where an individual plant species is estimated to amount to less than 0.5 percent, the symbol (-) is used to indicate a trace amount. In unusual situations where an individual marsh is estimated to contain 50 percent or more of a species that is not listed as a marsh type, the closest applicable marsh type is used.

Marsh Types and Evaluation

For a better understanding of what is meant by marsh types, some background information is required. The personnel of the Wetland Advisory Group have classified twelve different, common marsh types in Virginia, based on vegetational composition. These marsh types have been evaluated according to certain values and are recorded in the Guidelines report. The following is a brief outline of the wetland types and their evaluation as found in that publication:

It is recognized that most wetlands areas, with the exception of the relatively monospecific cordgrass marshes of the Eastern Shore, are not homogeneously vegetated. Most marshes are, however, dominated by a major plant. By providing the manager with the primary values of each community type and the means of identification, he then has a useful and convenient tool for weighing the relative importance of each marsh parcel. In Virginia, many wetlands management problems involve only a few acres or a fraction of an acre. The identification of plant communities permits the manager to evaluate both complete marshes and subareas within a marsh.

Each marsh type may be evaluated in accordance with five general values. These are:

1. Production and detritus availability. Previous VIMS reports have discussed the details of marsh production and the role of detritus which results when the plant material is washed into the water column. The term "detritus" refers to plant material which decays in the aquatic system and forms the basis of a major marine food web. The term "production" refers to the amount of plant material which is produced by the various types of marsh plants. Vegetative production of the major species has been measured, and marshes have been rated in accordance with their average levels of productivity. If the production is readily available to the marine food web as detritus, a wetlands system is even more important than one of equal productivity where little detritus results. Availability of detritus is generally a function of marsh elevation and total flushing, with detritus more available to the aquatic environment in the lower, well-flushed marshes.

2. Waterfowl and wildlife utilization. Long before marshes were discovered to be detritus producers, they were known as habitats for various mammals and marsh birds and as food sources for migratory waterfowl. Some marsh types, especially mixed freshwater marshes, are more valuable because of diversity of the vegetation found there.

3. Erosion buffer. Erosion is a common coastal problem. Marshes can be eroded, but some, particularly the more saline types, are eroded much more slowly than adjacent shores which are unprotected by marsh. This buffering quality is derived from the ability of the vegetation to absorb or dissipate wave energy by establishing a dense root system which stabilizes the substrate. Generally, freshwater species are less effective than saltwater plants in this regard.

4. Water quality control. The dense growth of some marshes acts as a filter, trapping upland sediment before it reaches waterways, thus protecting shellfish beds and navigation channels from siltation. Marshes can also filter out sediments that are already in the water column. The ability of marshes to filter sediments and maintain water clarity is of particular importance to the maintenance of clam and oyster production. Excessive sedimentation can reduce the basic food supply of shellfish through reduction of the photic zone where algae grow. It can also kill shellfish by clogging their gills. Additionally, marshes can assimilate and degrade pollutants through complex chemical processes, a discussion which is beyond the scope of this paper.

5. Flood buffer. The peat substratum of some marshes acts as a giant sponge in receiving and releasing water. This characteristic is an effective buffer against coastal flooding, the effectiveness of which is a function of marsh type and size.

Research and marsh inventory work accomplished by VIMS personnel indicate that 10 species of marsh vegetation tend to dominate many marshes, the dominant plant depending on water salinity, marsh elevation, soil type, and other factors. The term "dominant" is construed to mean that at least 50% of the vegetated surface of a marsh is covered by a single species. Brackish and freshwater marshes often have no clearly dominant species of vegetation. These marshes are considered to be highly valuable in environmental terms.

Marsh Types and Their Environmental Contributions

(Edited from Guidelines for Activities Affecting Virginia Wetlands)

Type I Saltmarsh Cordgrass Community

a. Average yield 4 tons per acre per annum. (Optimum growth up to 10 tons per acre.)
b. Optimum availability of detritus to the marine environment.
c. Roots and rhizomes eaten by waterfowl and stems used in muskrat lodge construction. Also serves as nesting material for various birds.
d. Deterrent to shoreline erosion.
e. Serves as sediment trap and assimilates flood waters.

Type II Saltmeadow Community

a. 1-3 tons per acre per annum.
b. Food (seeds) and nesting areas for birds.
c. Effective erosion deterrent.
d. Assimilates flood waters.
e. Filters sediments and waste material.

Type III Black Needlerush Community

a. 3-5 tons per acre per annum.
b. Highly resistant to erosion.
c. Traps suspended sediments but not as effective as Type II.
d. Somewhat effective in absorbing flood waters.

Type IV Saltbush Community

a. 2 tons per acre per annum or less.
b. Nesting area for small birds and habitat for a variety of wildlife.
c. Effective trap for flotsam.

Type V Big Cordgrass Community

a. 3-6 tons per acre per annum.
b. Detritus less available than from Type I.
c. Habitat for small animals and used for muskrat lodges.
d. Effective erosion buffer.
e. Flood water assimilation.

Type VI Cattail Community

a. 2-4 tons per acre per annum.
b. Habitat for birds and utilized by muskrats.
c. Traps upland sediments.

Type VII Arrow Arum-Pickerel Weed Community

a. 2-4 tons per acre per annum.
b. Detritus readily available to marine environment.
c. Seeds eaten by wood ducks.
d. Susceptible to erosion from wave action and boat wakes, particularly in winter months.

Type VIII Reed Grass Community

a. 4-6 tons per acre per annum.
b. Little value to wildlife except for cover.
c. Invades marshes and competes with more desirable species.
d. Deters erosion on disturbed sites.

Type IX Yellow Pond Lily Community

a. Less than 1 ton per acre per annum.
b. Cover and attachment site for aquatic animals and algae.
c. Feeding territory for fish.

Type X Saltwort Community

a. Less than 0.5 tons per acre per annum.
b. Little value to aquatic or marsh animals.

Type XI Freshwater Mixed Community

a. 3-5 tons per acre per annum.
b. High diversity of wildlife.
c. High diversity of wildlife foods.
d. Often associated with fish spawning and nursery grounds.
e. Ranks high as a sediment trap and nursery grounds.

Type XII Brackish Water Mixed Community

a. 3-4 tons per acre per annum.
b. Wide variety of wildlife foods and habitat.
c. Deterrent to shoreline erosion.
d. Serves as sediment trap and assimilates flood waters.
e. Known spawning and nursery grounds for fish.

Evaluation of Wetland Types

(From Guidelines for Activities Affecting Virginia Wetlands)

For management purposes, the twelve types of wetlands identified above are grouped into five classifications based on the estimated total environmental value of an acre of each type.

Group One: Saltmarsh Cordgrass (Type I)
Arrow Arum-Pickerel Weed (Type VII)
Freshwater Mixed (Type XI)
Brackish Water Mixed (Type XII)

Group One marshes have the highest values in productivity and wildfowl and wildlife utility and are closely associated with fish spawning and nursery areas. They also have high value as erosion inhibitors, are important to the shellfish industry, and are valued as natural shoreline stabilizers. Group One marshes should be preserved.

Group Two: Big Cordgrass (Type V)
Saltmeadow (Type II)
Cattail (Type VI)

Group Two marshes are of only slightly lesser value than Group One marshes. The major difference is that detritus produced in these marshes is less readily available to the marine environment due to higher elevations and consequently less tidal action to flush the detritus into adjacent waterways. Group Two marshes have very high values in protecting water quality and acting as buffers against coastal flooding. These marshes should also be preserved; but if development in wetlands is considered to be justified, it would be better to alter Group Two marshes than Group One marshes.

Group Three: Yellow Pond Lily (Type IX)
Black Needlerush (Type III)

The two marshes in the Group Three category are quite dissimilar in properties. The yellow pond lily marsh is not a significant contributor to the food web, but it does have high values to wildlife and waterfowl. Black needlerush has little wildlife value, but it ranks high as an erosion flood buffer. Group Three marshes are important, though their total values are less than Group One and Two marshes. If development in wetlands is considered necessary, it would be better to alter Group Three marshes than Groups One or Two.

Group Four: Saltbush (Type IV)

The saltbush community is valued primarily for the diversity and bird nesting area it adds to the marsh ecosystem. To a lesser extent it acts as an erosion buffer. Group Four marshes should not be unnecessarily disturbed, but it would be better to concentrate necessary development in these marshes rather than disturb any of the marshes in the preceding groups.

Group Five: Saltwort (Type X)
Reedgrass (Type VIII)

Based on present information, Group Five marshes have few values of any significance. While Group Five marshes should not be unreasonably disturbed, it is preferable to develop in these marshes than in any other types.

Marsh Plants

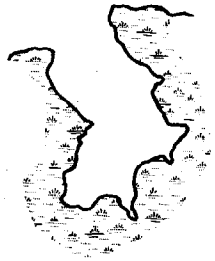
Common names and scientific names as found in the data tables of this report.

Saltmarsh Cordgrass	*Spartina alterniflora*
Black Needlerush	*Juncus roemerianus*
Salt Grass	*Distichlis spicata*
Saltmeadow Hay	*Spartina patens*
Saltbushes	
Marsh Elder	*Iva frutescens*
Groundsel Tree	*Baccharis halimifolia*
Big Cordgrass	*Spartina cynosuroides*
Reed Grass	*Phragmites australis*
Cattails	*Typha angustifolia*
	Typha latifolia
Giant Foxtail Grass	*Setaria magna*
Marsh Fleabane	*Pluchea purpurascens*
Marsh Mallow	*Kosteletskya virginica*
Orach	*Atriplex patula*
Saltmarsh Aster	*Aster tenuifolius*
Sea Oxeye	*Borrichia frutescens*
Switch Grass	*Panicum virgatum*
Water Hemp	*Amaranthus cannabinus*

Glossary of Descriptive Terms

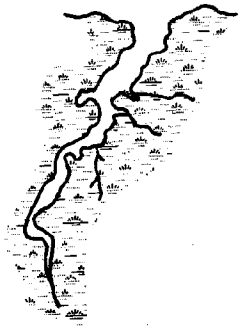
Cove Marsh

A marsh contained within a concavity or recessed area on a shoreline. The marsh vegetation is usually found surrounding a central, open-water pond, and tidal flushing is permitted through an inlet.



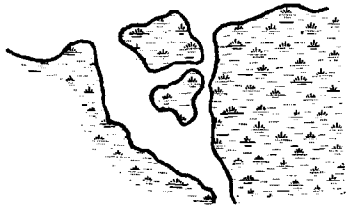
Creek or Embayed Marsh

A marsh occupying a drowned creek valley. In many large creek marshes the salinity decreases headward; this type of marsh may be divided for inventory purposes into sections if significant changes in the plant community occur along its length.



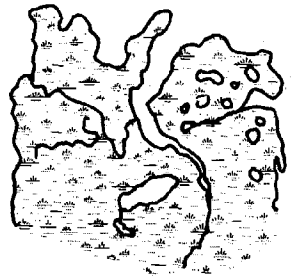
Delta Marsh

A marsh growing on sediment deposited at the mouth of a tidal creek. Tidal exchange through the creek mouth is usually restricted to narrow channels by the marsh.



Extensive Marsh

A large marsh where the length and depth or width are roughly comparable. Most extensive marshes are drained by many tidal channels and creeks which have little freshwater input.



Fringe Marsh

A marsh which borders a section of shoreline and generally has a much greater length than width or depth.

High Marsh

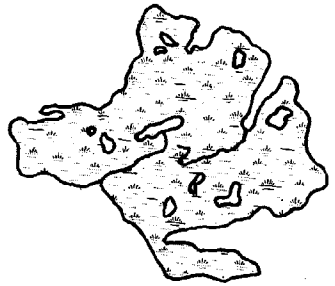
The marsh surface is at an elevation of mean high water or above; it is usually inundated less than twice daily by tidal action.

Low Marsh

The marsh surface is at an elevation below mean high water; it is usually inundated twice daily by tidal action.

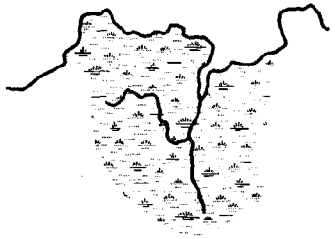
Marsh Island

An isolated marsh surrounded on all sides by open water. Interior portions of the marsh may contain trees scattered at highest elevations.



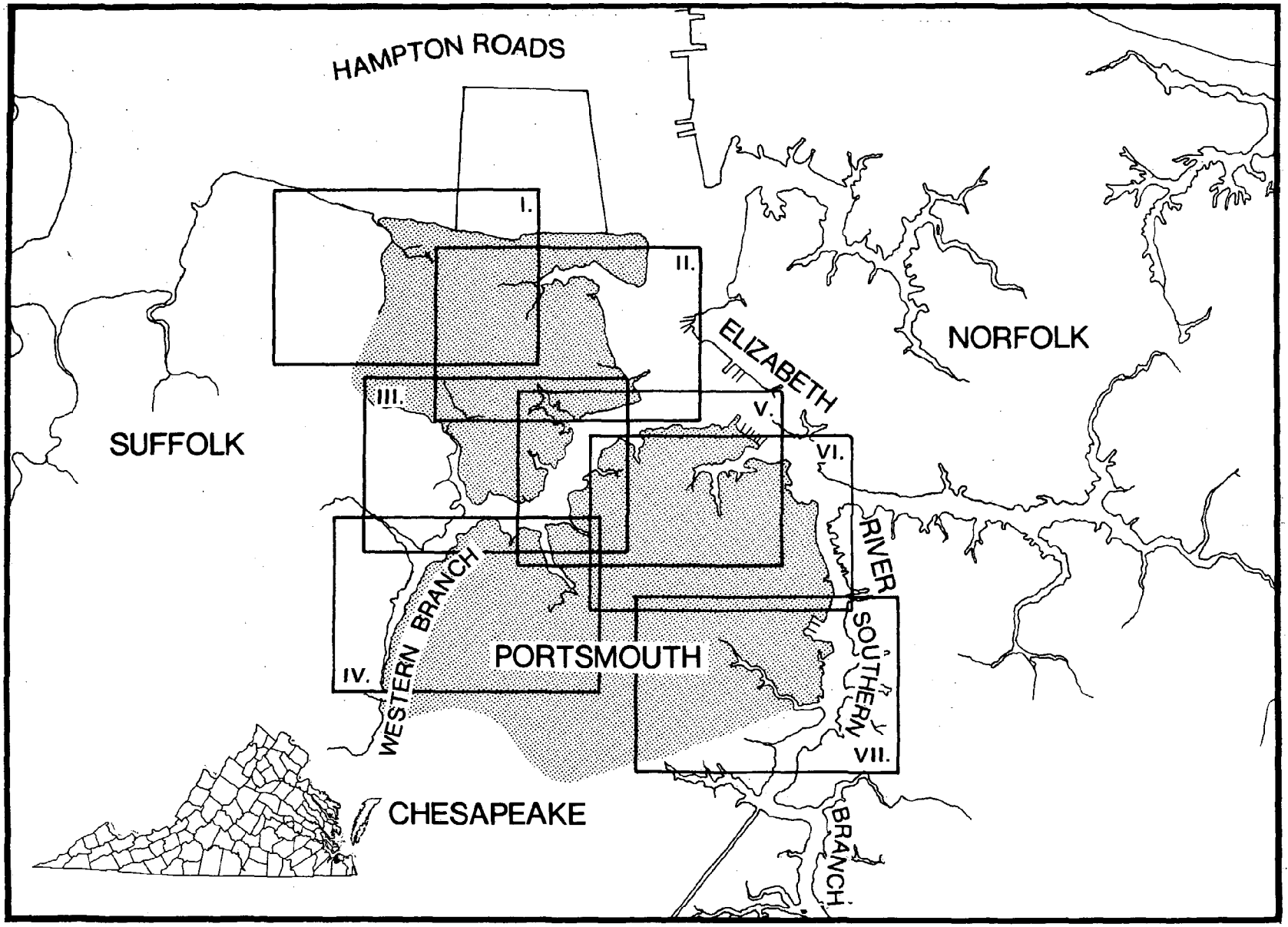
Pocket Marsh

A marsh contained within a small, essentially semi-circular area on a shoreline.



Point or Spit Marsh

A marsh which extends from the uplands in the form of a point or spit. Its development is usually influenced by tidal currents that form a sand berm behind which the marsh forms.


HAMPTON ROADS
I.
II.
III.
IV.
V.
VI.
VII.
NORFOLK
ELIZABETH
RIVER
SUFFOLK
PORTSMOUTH
WESTERN BRANCH
SOUTHERN
BRANCH
CHESAPEAKE

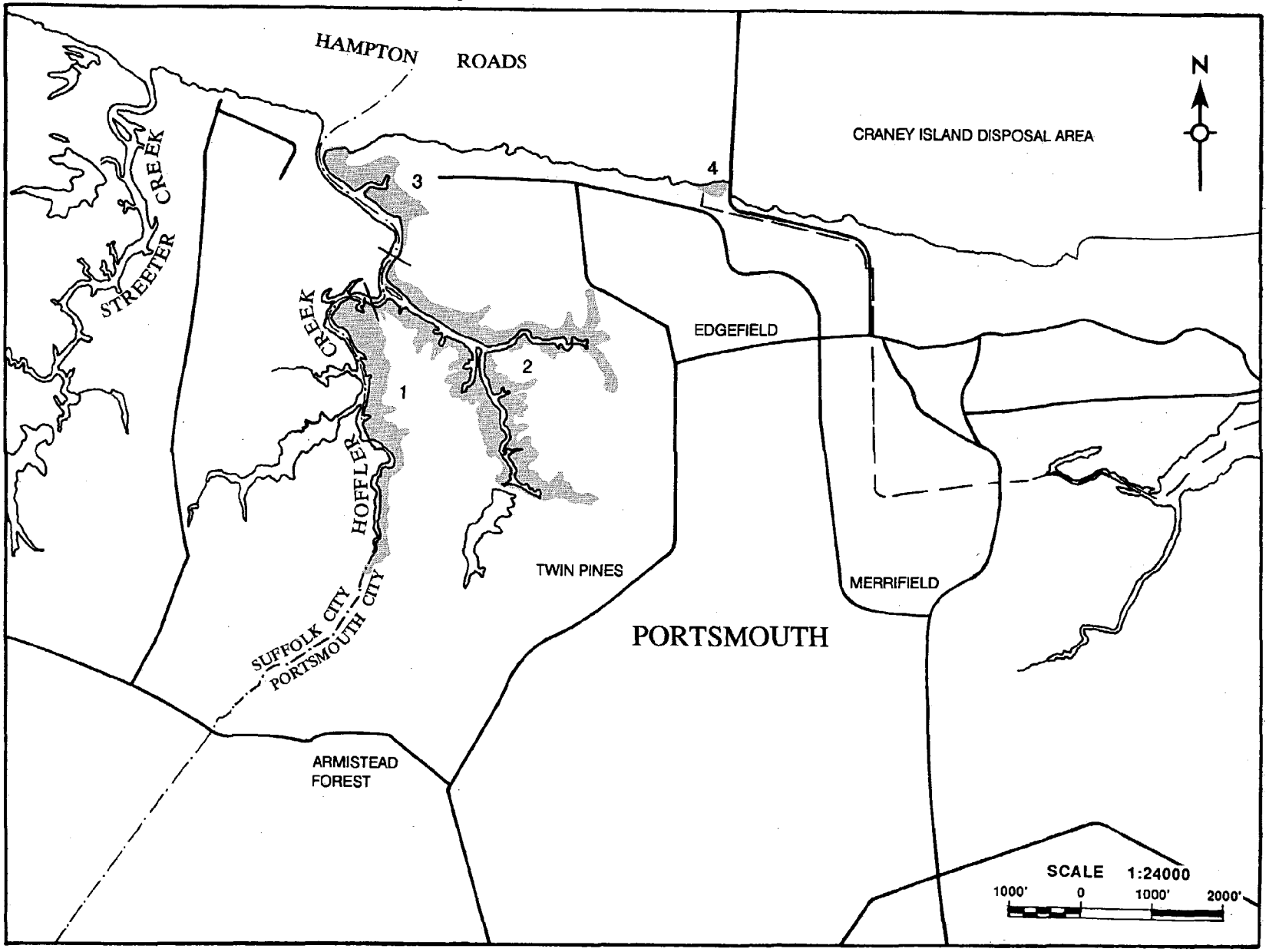
Section I

Hoffler Creek and Craney Island

The main branch of Hoffler Creek is the boundary line between the City of Portsmouth and the City of Suffolk. Only those wetlands found in Portsmouth are recorded in this report. The marshes located in the Suffolk portion of Hoffler Creek will be recorded in a report at a later date.

The marshes in this system are relatively undisturbed. Hoffler Creek is an anomaly in the Tidewater urban environment. The shoreline along the creek is largely undeveloped except at the very upper end of the main branch. Most of the remaining shoreline is forested at the present time. The marshes are low, intertidal and dominated by saltmarsh cordgrass (*Spartina alterniflora*), one of the most productive and ecologically important of all tidal marshes. The largest single marsh (#2) occupies an unnamed eastern branch of Hoffler Creek. This marsh is 58.44 acres in area and is the largest single, tidal wetland in the City of Portsmouth. The marshes of this creek system total 97.5 acres and are the largest tidal wetland complex in the City.

Section I. Hoffler Creek And Craney Island



Section I. Hoffler Creek And Craney Island

#	MARSH LOCATION	TOTAL ACRES	SALTMARSH CORDGRASS	BLACK NEEDLERUSH	SALTMEADOW HAY	SALTBUSH	BIG CORDGRASS	REEDGRASS	CATTAILS	FOXTAIL GRASS	MARSH FLEABANE	MARSH MALLOW	ORACH	SALTMARSH ASTER	SEA OXEYE	WATER HEMP	OBSERVATIONS	MARSH TYPE
1	Hoffler Creek	24.60	95		3			2	--								Extensive creek marsh	I
			23.37		.74			.49										
2	Hoffler Creek	58.44	95		5	--	--	--	--								Creek marsh	I
			55.52		2.92													
3	Hoffler Creek	14.41	85	--	10	5											Embayed fringe marsh	I
			12.25		1.44	.72												
4	Craney Island	1.00	85			5		10									Pocket marsh, fill	I
			.85			.05		.10										
	Total Section I	98.45																
			91.99		5.10	.77		.59										

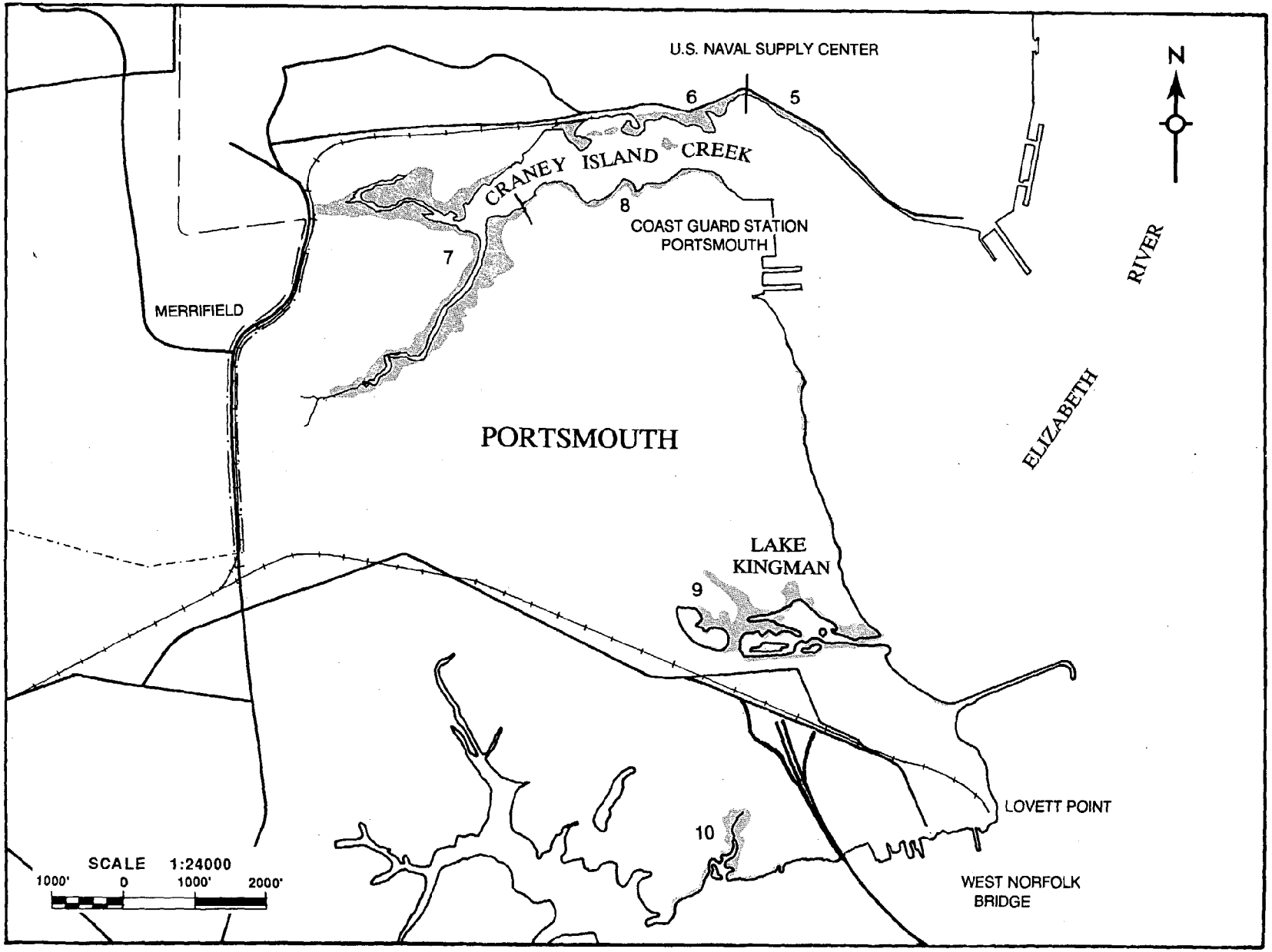
Section II

Craney Island to the Western Branch of the Elizabeth River

Two tributaries of the Main Branch of the Elizabeth River, Craney Island Creek and Lake Kingman, contain most of the marshes in this section. One of the largest single marshes in the City of Portsmouth is found in Craney Island Creek. Marsh #7 (51.36 acres) is dominated by saltmarsh cordgrass, but also is vegetated by a significant amount (15.41 acres) of reed grass (*Phragmites australis*) an aggressive, less desirable species that typically invades disturbed wetlands. Reed grass in this system, as well as other marshes in Portsmouth, is more abundant than when the initial field work was done in 1978. There is a clear indication that filling and/or increased upland runoff have continued during this 10 year period, thereby affording *Phragmites* opportunities to invade and/or expand into a number of marshes.

Lake Kingman is a shallow tributary dominated by *Spartina alterniflora.* Reed grass has also increased in this system since 1978, indicating disturbances caused by filling or upland runoff or both.

SECTION II. CRANEY ISLAND CREEK TO WESTERN BRANCH ELIZABETH RIVER



Section II. Craney Island Creek To The Western Branch Of The Elizabeth River

*	MARSH LOCATION	TOTAL ACRES	SALTMARSH CORDGRASS	BLACK NEEDLERUSH	SALTMEADOW HAY	SALTBUSH	BIG CORDGRASS	REEDGRASS	CATTAILS	FOXTAIL GRASS	MARSH FLEABANE	MARSH MALLOW	ORACH	SALTMARSH ASTER	SEA OXEYE	WATER HEMP	OBSERVATIONS	MARSH TYPE
5	Craney Island Creek	.50	80					20									Fringe marsh	I
			.40					.10										
6	Craney Island Creek	9.00	70	3		3		24									Fringe and spit marsh	I
			6.30	.27		.27		2.16										
7	Craney Island Creek	51.36	70	--		--		30									Creek marsh	I
			35.95					15.41										
8	Craney Island Creek	6.00	50	5				45									Fringe marsh	I
			3.00	.30				2.70										
9	Lake Kingman	19.93	90	--	--	--		10									Creek marsh	I
			17.94					1.99										
10	Western Branch Elizabeth River	6.03	70	5	5			20									Creek marsh	I
			4.22	.30	.30			1.21										
	Total Section II	92.82																
			67.81	.87	.30	.27		23.57										

Section III

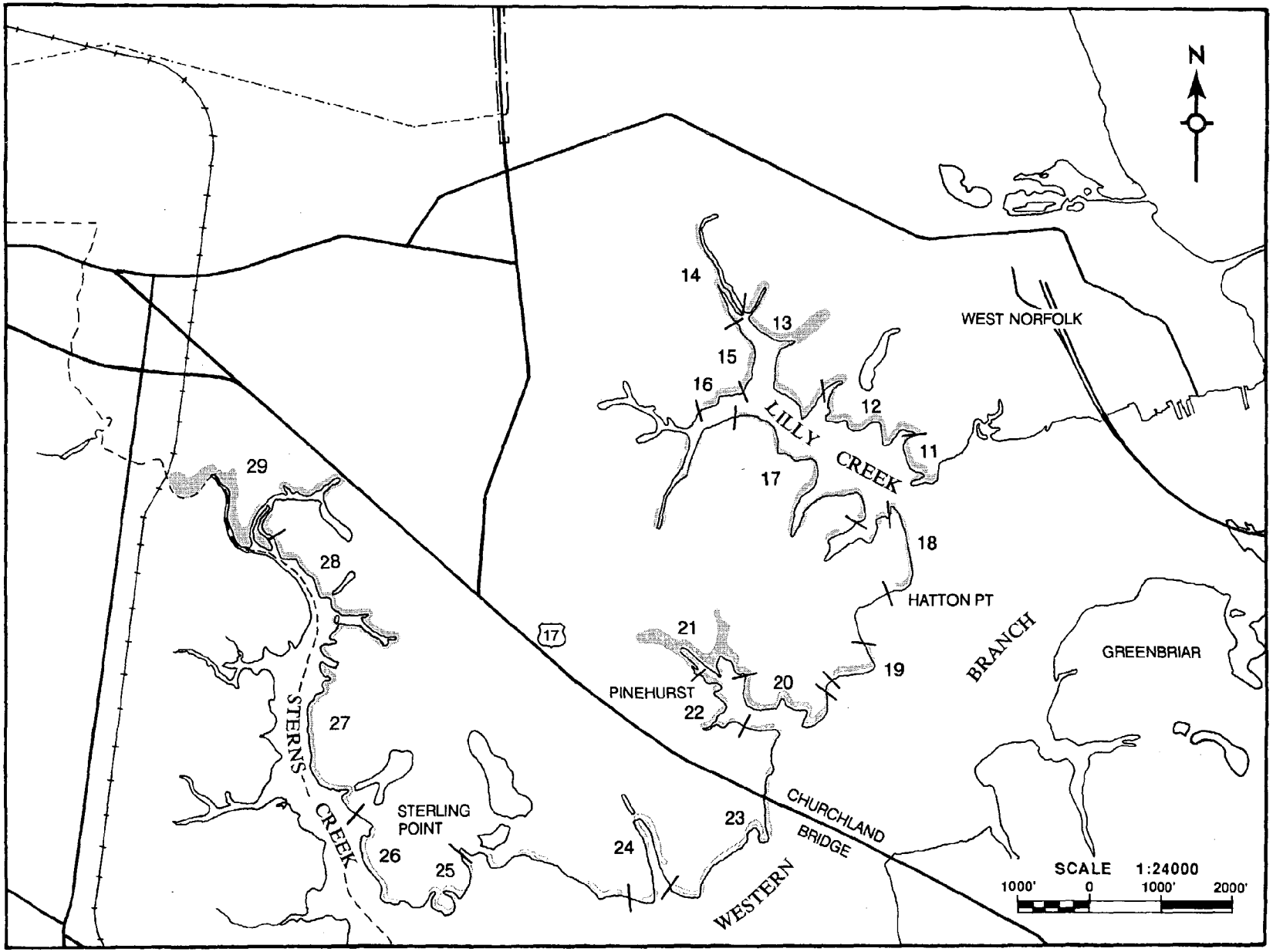
Lilly Creek and Sterns Creek

A total of 19 marshes are found in this section, occurring mainly in Lilly and Sterns creeks and an unnamed tributary of the Western Branch of the Elizabeth River. Most of the wetlands are small, intertidal, fringe marshes dominated by saltmarsh cordgrass. A number of these marshes occurring in urban residential settings have been modified to some exent by dredging and shoreline defense structures.

The largest marsh in this section is marsh #29 (13.00 acres) located at the upper end of Sterns Creek. This wetland has been modified by dredging activities at sometime in the past. Sterns Creek marks the boundary between the City of Portsmouth and the City of Chesapeake. Only those marshes found in Portsmouth are recorded in this report.

All the marshes in this section are dominated by saltmarsh cordgrass, a productive contributor to the estuarine food web. Herons and other aquatic waterfowl were plentiful during our field observations.

Section III. Lilly Creek and Sterns Creek



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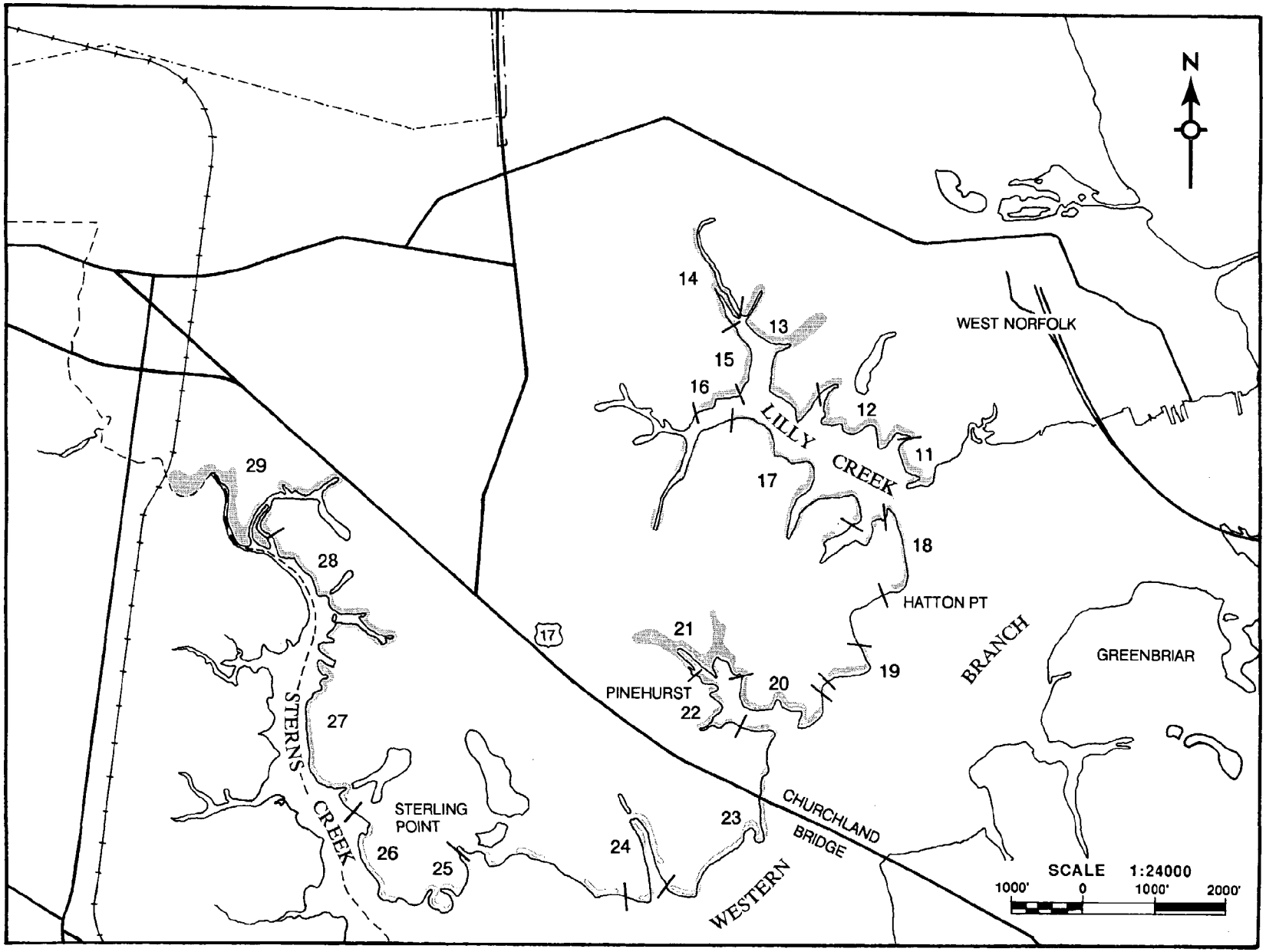
All the marshes in this section are dominated by saltmarsh cordgrass, a productive contributor to the estuarine food web. Herons and other aquatic waterfowl were plentiful during our field observations.

Section III. Lilly Creek and Sterns Creek



Section III. Lilly Creek and Sterns Creek

#	MARSH LOCATION	TOTAL ACRES	SALTMARSH CORDGRASS	BLACK NEEDLERUSH	SALTMEADOW HAY	SALTBUSH	BIG CORDGRASS	REEDGRASS	CATTAILS	FOXTAIL GRASS	MARSH FLEABANE	MARSH MALLOW	ORACH	SALTMARSH ASTER	SEA OXEYE	WATER HEMP	OBSERVATIONS	MARSH TYPE
11	Lilly Creek	2.11	90	5		5											Fringe marsh with embayed area	I
			1.90	.11		.11												
12	Lilly Creek	3.00	90	--		10											Fringe marsh	I
			2.70			.30												
13	Lilly Creek	4.48	90			5		5									Fringe marsh	I
			4.03			.22		.22										
14	Lilly Creek	7.16	70			20		10	--								Fringe marsh	I
			5.01			1.43		.72										
15	Lilly Creek	1.72	95			5											Fringe marsh	I
			1.63			.09												
16	Lilly Creek	.75	90			5		5									Fringe marsh with embayed area	I
			.68			.03		.03										
17	Lilly Creek	4.48	90	3		5		2									Fringe marsh	I
			4.03	.13		.22		.09										
18	Hatton Point	.25	80	5		10		5									Fringe marsh	I
			.20	.01		.03		.01										

#	MARSH LOCATION	TOTAL ACRES	SALTMARSH CORDGRASS	BLACK NEEDLERUSH	SALTMEADOW HAY	SALTBUSH	BIG CORDGRASS	REEDGRASS	CATTAILS	FOXTAIL GRASS	MARSH FLEABANE	MARSH MALLOW	ORACH	SALTMARSH ASTER	SEA OXEYE	WATERHEMP	OBSERVATIONS	MARSH TYPE
19	Western Branch Elizabeth River	.25	100														Fringe marsh	I
			.25															
20	Western Branch Elizabeth River	.92	85	5		10											Fringe marsh	I
			.78	.05		.09												
21	Western Branch Elizabeth River	8.00	90	1		5		1	2			--				1	Embayed marsh	I
			7.20	.08		.40		.08	.16							.08		
22	Western Branch Elizabeth River	.64	85			10		5									Intermittent fringe marsh	I
			.54			.06		.03										
23	Western Branch Elizabeth River	1.50	90			10											Fringe marsh, rubble fill	I
			1.35			.15												
24	Western Branch Elizabeth River	.50	90			10		--									Fringe marsh, rubble fill	I
			.45			.05												
25	Western Branch Elizabeth River	.25	80	5	5	10											Fringe marsh with point	I
			.20	.01	.01	.03												
26	Sterns Creek	.75	90			5	5										Fringe marsh	I
			.68			.04	.04											

#	MARSH LOCATION	TOTAL ACRES	SALTMARSH CORDGRASS	BLACK NEEDLERUSH	SALTMEADOW HAY	SALTBUSH	BIG CORDGRASS	REEDGRASS	CATTAILS	FOXTAIL GRASS	MARSH FLEABANE	MARSH MALLOW	ORACH	SALTMARSH ASTER	SEA OXEYE	WATER HEMP	OBSERVATIONS	MARSH TYPE
27	Sterns Creek	1.00	90			5	5	–									Long intermittent narrow fringe marsh	I
			.90			.05	.05											
28	Sterns Creek	2.20	50			40	5	5									Fringe marsh with island	I
			1.10			.88	.11	.11										
29	Sterns Creek	13.00	85			10	3	2									Creek marsh	I
			11.05			1.30	.39	.26										
	Total Section III	52.96																
			44.68	.39	.01	5.48	.59	1.55	.16							.08		

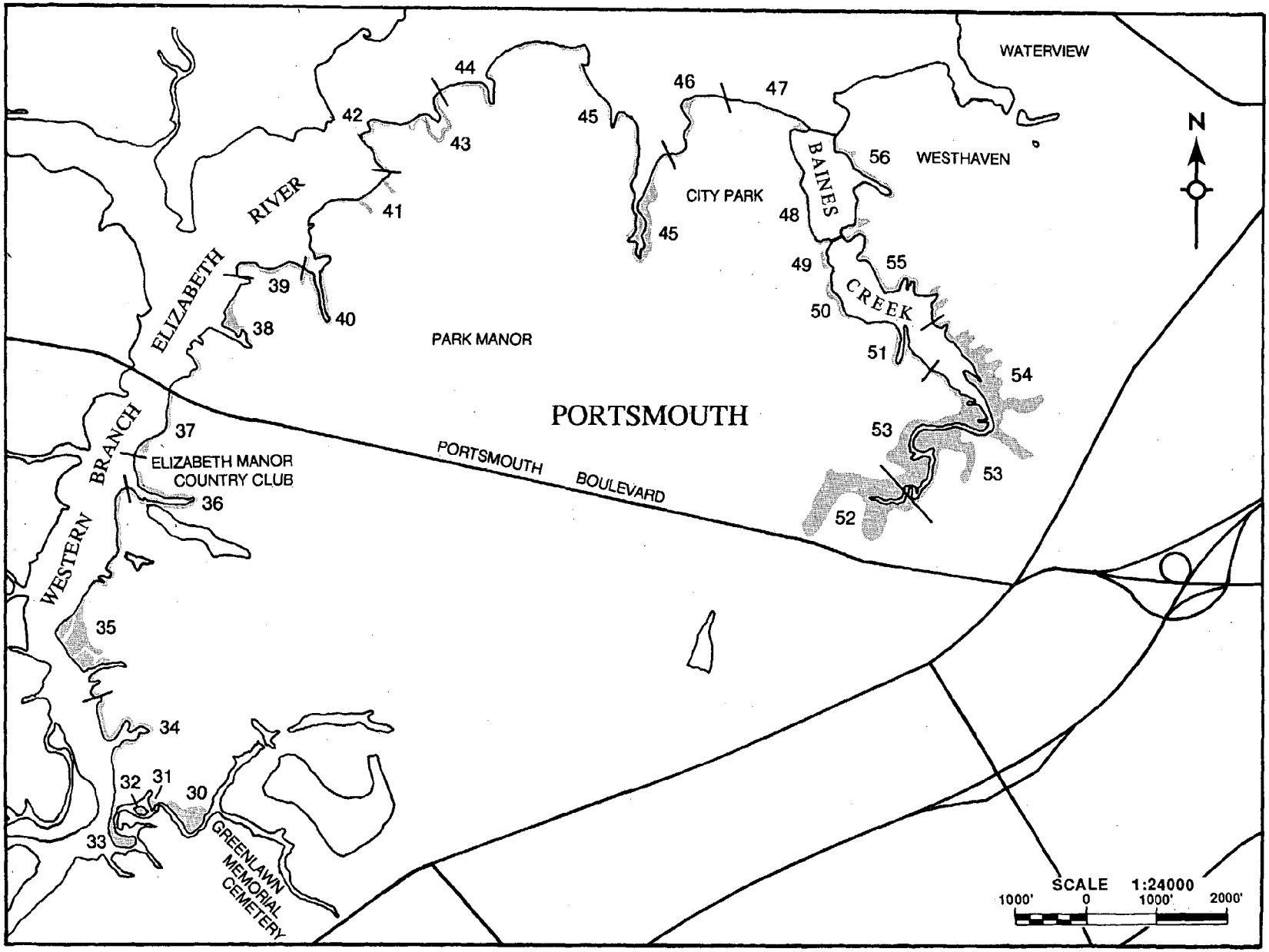
Section IV

Greenlawn Cemetery to Baines Creek

Section IV contains those wetlands along the Western Branch of the Elizabeth River, from the boundary of the City of Portsmouth and the City of Chesapeake, to and including Baines Creek. There are 27 marshes in this section, the majority of them occurring along the Western Branch shoreline. Several of these tidal wetlands have been modified by channel dredging and filling. Marsh #35 on the Western Branch, for example, has had several channels cut through it. Fill placed on the surface of the marsh during dredging operations is now vegetated by saltbushes (*Iva frutescens* and *Baccharis halimifolia*) and an associated saltmeadow community (*Spartina patens* and *Distichlis spicata*). The unnamed creek the separates Portsmouth and Chesapeake also has evidence of past dredge and fill activities.

Baines Creek has a relatively large complex of individual marshes. The largest wetlands in the system lie at the upper reaches of this tidal waterway. The marshes that occupy this zone of the creek are dominated by *Spartina alterniflora,* but also have traces of species that would indicate reduced salinity. Such species as narrow-leaved cattail (*Typha angustifolia*), water hemp (*Amaranthus cannabinus*), and marsh fleabane (*Pluchea purpurascens*) are indicative of the reduced salinity of brackish water.

Section IV. Greenlawn Cemetery to Baines Creek



Section IV. Greenlawn Cemetery to Baines Creek

#	MARSH LOCATION	TOTAL ACRES	SALTMARSH CORDGRASS	BLACK NEEDLERUSH	SALTMEADOW HAY	SALTBUSH	BIG CORDGRASS	REEDGRASS	CATTAILS	FOXTAIL GRASS	MARSH FLEABANE	MARSH MALLOW	ORACH	SALTMARSH ASTER	SEA OXEYE	WATER HEMP	OBSERVATIONS	MARSH TYPE
30	Western Branch Elizabeth River	3.41	70	5		10	2	3					10			--	Creek marsh	I
			2.39	.17		.34	.07	.10					.34					
31	Western Branch Elizabeth River	.25	60	3	20	12	5		--								Creek marsh	I
			.15	.01	.05	.03	.01											
32	Western Branch Elizabeth River	.50	80	10		10											Island marsh	I
			.40	.05		.05												
33	Western Branch Elizabeth River	1.69	55	3	20	15	5	--								2	Spit marsh	I
			.93	.05	.34	.25	.08									.03		
34	Western Branch Elizabeth River	.64	70	10		10	10	--									Fringe marsh	I
			.45	.06		.06	.06											
35	Western Branch Elizabeth River	8.97	30	10	20	30	10	--								--	Marsh with channels	XII
			2.69	.90	1.79	2.69	.90											
36	Western Branch Elizabeth River	2.20	60			20		--									Fringe marsh	I
			1.76			.44												
37	Western Branch Elizabeth River	.75	80			10		10									Fringe marsh	I
			.60			.08		.08										

#	MARSH LOCATION	TOTAL ACRES	SALTMARSH CORDGRASS	BLACK NEEDLERUSH	SALTMEADOW HAY	SALTBUSH	BIG CORDGRASS	REEDGRASS	CATTAILS	FOXTAIL GRASS	MARSH FLEABANE	MARSH MALLOW	ORACH	SALTMARSH ASTER	SEA OXEYE	WATER HEMP	OBSERVATIONS	MARSH TYPE
54	Baines Creek	.25	80			10			10								Pocket marsh	I
			.20			.02			.02									
55	Baines Creek	.55	90			10											Fringe marsh	I
			.50			.06												
56	Baines Creek	.64	20	10	40	10		20									Fringe marsh	I
			.13	.06	.26	.06		.13										
	Total Section IV	88.57																
			65.35	2.15	2.92	8.95	2.79	1.94	.02	.01			.71			3.74		

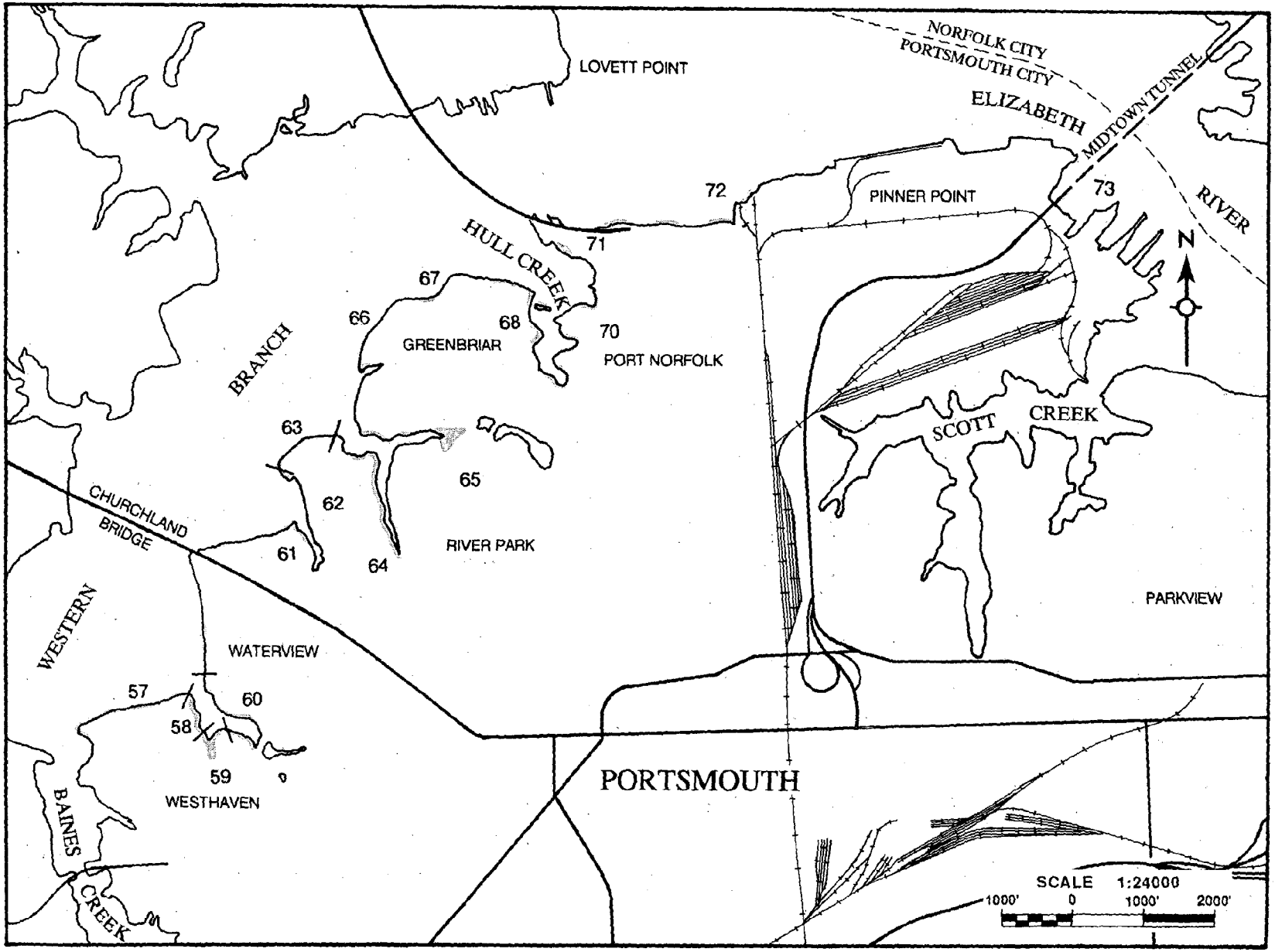
Section V

Baines Creek to Pinner Point

The marshes of this section are found along the shoreline and minor tributaries and inlets of the Western Branch of the Elizabeth River and the main branch of the Elizabeth River. Portions of many of these small tributaries, including Hull Creek, have been filled and modified to the extent that some of them are barely recognizable from early maps and charts. It can only be imagined how many acres of wetlands have been lost in the last 100 years.

All of the marshes in this section are small, ranging from 2.5 acres to .25 acres in area. *Spartina alterniflora* dominates in all of the marshes in this section. As one would expect in an urban area, shoreline modifications have altered a number of the wetlands through bulkheading, filling and channelization. In addition to saltmarsh cordgrass, other species such as big cordgrass (*Spartina cynosuroides*), saltbushes, black needlerush (*Juncus roemerianus*), reed grass, saltmeadow hay and salt grass are found in these marshes.

Section V. Baines Creek to Pinner Point



Section V. Baines Creek to Pinner Point

#	MARSH LOCATION	TOTAL ACRES	SALTMARSH CORDGRASS	BLACK NEEDLERUSH	SALTMEADOW HAY	SALTBUSH	BIG CORDGRASS	REEDGRASS	CATTAILS	FOXTAIL GRASS	MARSH FLEABANE	MARSH MALLOW	ORACH	SALTMARSH ASTER	SEA OXEYE	WATER HEMP	OBSERVATIONS	MARSH TYPE
57	Western Branch Elizabeth River	.25	90			--	10										Fringe marsh	I
			.23				.03											
58	Western Branch Elizabeth River	1.00	50	5	20	20		5									Fringe marsh	I
			.50	.05	.20	.20		.05										
59	Western Branch Elizabeth River	1.50	90			10											Pocket marsh dominated by saltmarsh cordgrass	I
			1.35			.15												
60	Western Branch Elizabeth River	1.30	80	10		10											Fringe marsh	I
			1.04	.13		.13												
61	Western Branch Elizabeth River	.27	80			10		10									Fringe marsh with small point area	I
			.22			.03		.03										
62	Western Branch Elizabeth River	.96	80	5		5	5	5									Fringe marsh 20-30' wide	I
			.77	.05		.05	.05	.05										
63	Western Branch Elizabeth River	.40	90			10											Fringe marsh	I
			.36			.04												
64	Western Branch Elizabeth River	.73	80	--	5	5		10									Fringe marsh 10-30' wide disrupted by rubble	I
			.58		.04	.04		.07										

#	MARSH LOCATION	TOTAL ACRES	SALTMARSH CORDGRASS	BLACK NEEDLERUSH	SALTMEADOW HAY	SALTBUSH	BIG CORDGRASS	REEDGRASS	CATTAILS	FOXTAIL GRASS	MARSH FLEABANE	MARSH MALLOW	ORACH	SALTMARSH ASTER	SEA OXEYE	WATER HEMP	OBSERVATIONS	MARSH TYPE
65	Western Branch Elizabeth River	2.50	95			5											Pocket marsh partially filled	I
			2.38			.13												
66	Western Branch Elizabeth River	.25	90		--	10											Fringe marsh	I
			.23			.03												
67	Western Branch Elizabeth River	.25	80		--	20											Fringe marsh	I
			.20			.05												
68	Hull Creek	.78	50	10		40											Small island marsh	I
			.39	.08		.31												
69	Hull Creek	.37	90			5		5									Cove area with fringe marsh 10-20' wide	I
			.33			.02		.02										
70	Hull Creek	.25	95					5									Embayed marsh	I
			.24					.01										
71	Hull Creek	1.00	85			5	5	5									Embayed marsh	I
			.85			.05	.05	.05										
72	Western Branch Elizabeth River	.25	70			30		--									Fringe marsh	I
			.18			.08												

#	MARSH LOCATION	TOTAL ACRES	SALTMARSH CORDGRASS	BLACK NEEDLERUSH	SALTMEADOW HAY	SALTBUSH	BIG CORDGRASS	REEDGRASS	CATTAILS	FOXTAIL GRASS	MARSH FLEABANE	MARSH MALLOW	ORACH	SALTMARSH ASTER	SEA OXEYE	WATER HEMP	OBSERVATIONS	MARSH TYPE
73	Eastern Branch Elizabeth River	.25	100														Fringe marsh	I
			.25															
	Total Section V	12.31																
			10.10	.31	.24	1.31	.13	.28										

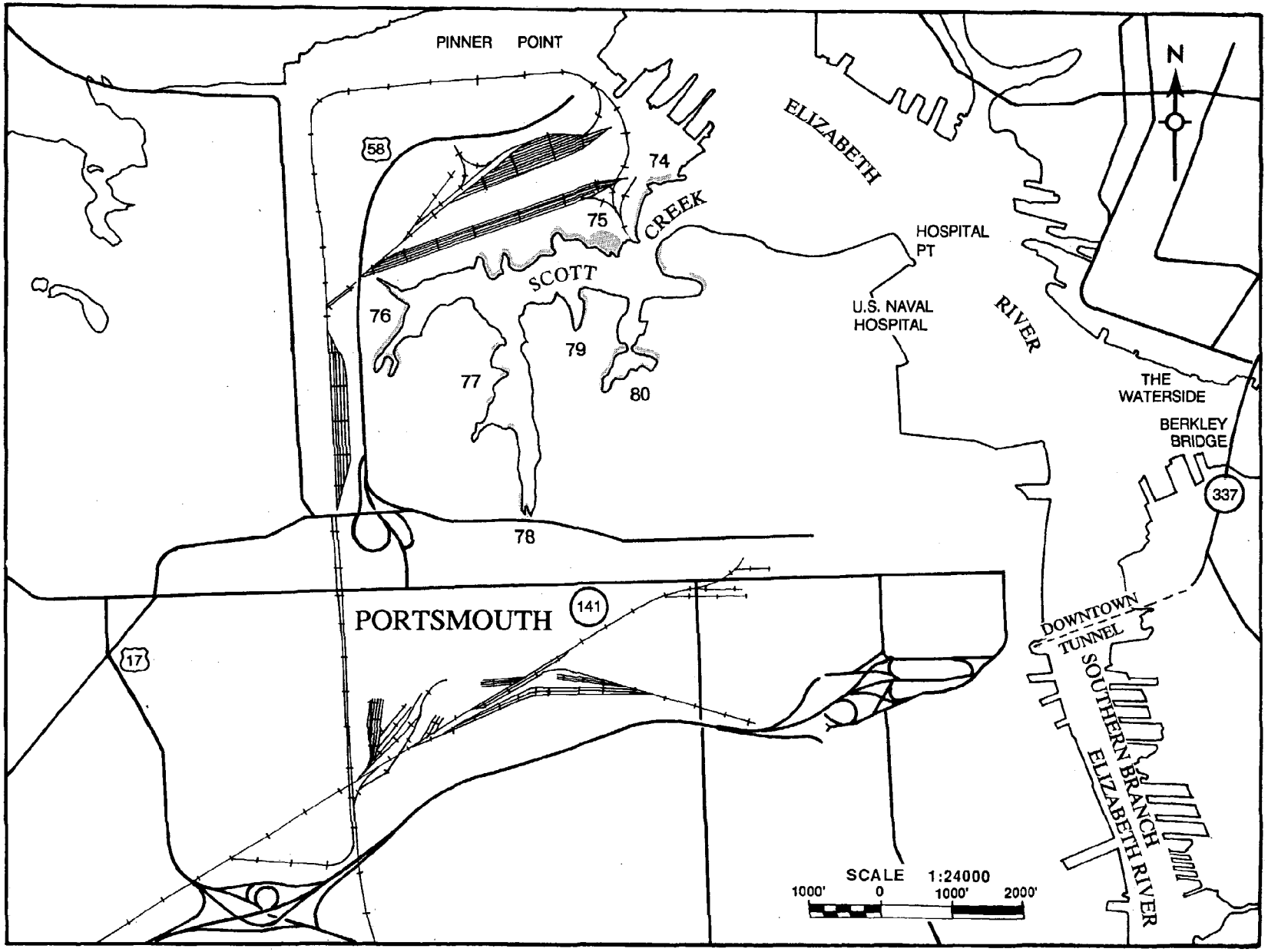
Section VI

Scott Creek

This section contains all of the tidal marshes in Scott Creek, a tributary of the main branch of the Elizabeth River. The northern shoreline and upland is used as railroad marshalling yard. The southern shoreline is largely urban/residential. Scott Creek has been subjected to development pressures of the years. Archival material (Map of Hampton Roads, U.S. Geodetic Survey, 1894) indicates that nearly 30% of the original waterway has been lost to filling in order to accommodate urban and industrial expansion. One of its southern branches had extended beyond London Street to present day I-264. This area is now occupied by residences, a school and recreation areas, railroad tracks and streets. Other branches have been similarly modified.

The tidal wetlands in Scott Creek are typical of many urban marshes. Most of them are small, fringing marshes, often only remnants of former larger wetlands. Even though these marshes are small and of fewer number than in the past, they continue to provide ecological functions of detritus production, fish and wildlife habitat, filtering of upland runoff, shoreline erosion protection and flood buffering even in their highly developed surroundings. In fact, they are likely all the more important as oases of a natural environment in an urban setting.

Section VI. Scott Creek



Section VI. Scott Creek

#	MARSH LOCATION	TOTAL ACRES	SALTMARSH CORDGRASS	BLACK NEEDLERUSH	SALTMEADOW HAY	SALTBUSH	BIG CORDGRASS	REEDGRASS	CATTAILS	FOXTAIL GRASS	MARSH FLEABANE	MARSH MALLOW	ORACH	SALTMARSH ASTER	SEA OXEYE	WATER HEMP	OBSERVATIONS	MARSH TYPE
74	Scott Creek	.50	60	--		15		25									Fringe marsh	I
			.30			.08		.13										
75	Scott Creek	2.00	80			10		10									Fringe and embayed marsh	I
			1.60			.20		.20										
76	Scott Creek	1.82	80			15			--							5	Fringe marsh with spit	I
			1.46			.27										.09		
77	Scott Creek	.25	90			10											Point marsh	I
			.23			.03												
78	Scott Creek	1.80	90	--		10											Narrow fringe marsh	I
			1.62			.18												
79	Scott Creek	.45	90			10											Fringe marsh with rubble	I
			.41			.05												
80	Scott Creek	.50	70		20	10		--							--		Two large pocket marshes with intermittent narrow fringe	I
			.35		.10	.05												
	Total Section VI	7.32																
			5.97		.10	.86		.33								.09		

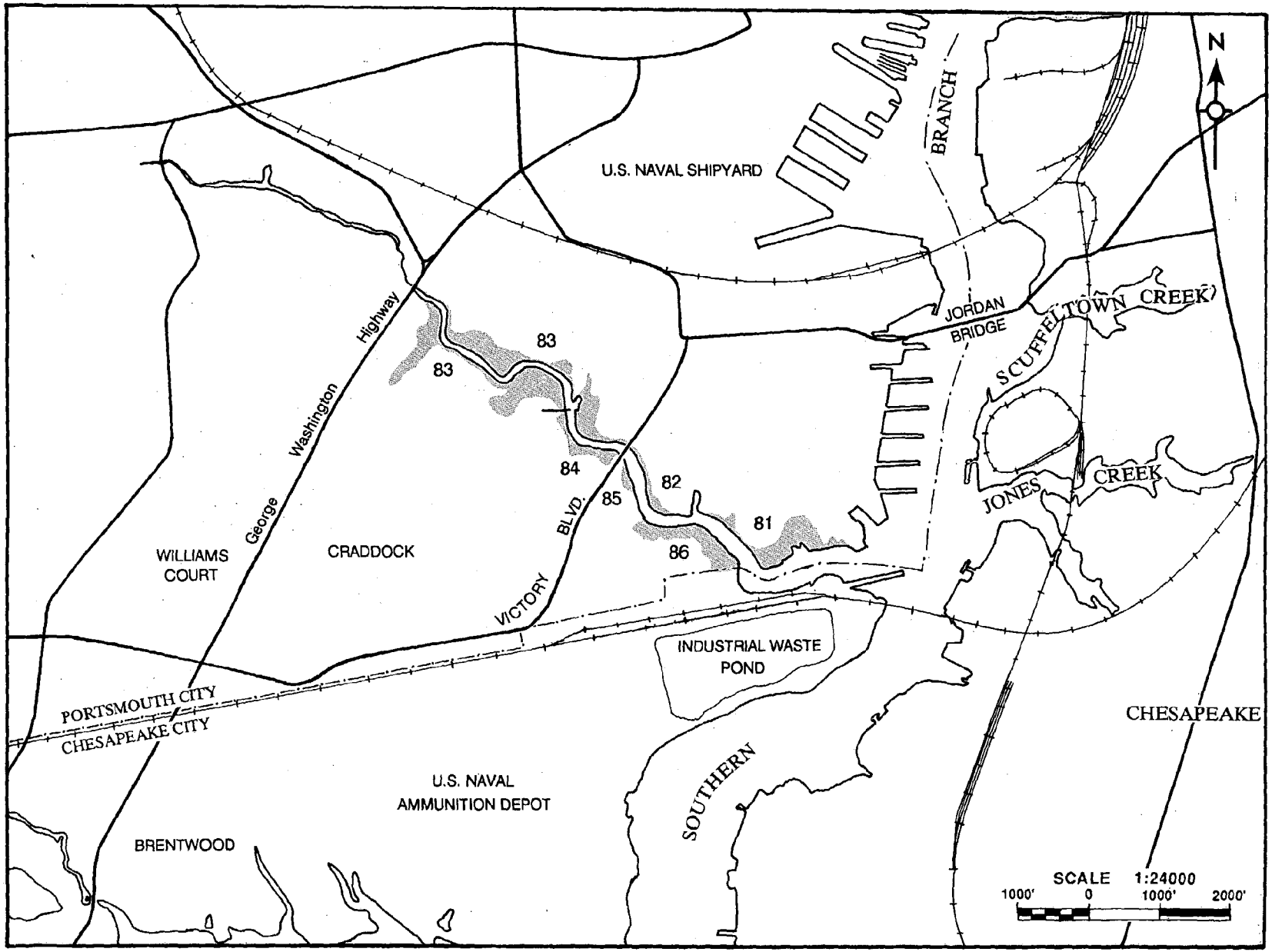
Section VII

Paradise Creek

Paradise Creek is the third largest marsh creek complex in total area in the City of Portsmouth. The creek is located adjacent to the massive Naval Shipyard complex on the Southern Branch of the Elizabeth River. There are no remaining tidal wetlands along the western shoreline of the Southern Branch from its mouth to Paradise Creek. Although saltmarsh cordgrass is the most common marsh plant in the system, reed grass communites are rather significant. Reed grass is often indicative of disturbed wetlands, likely invading areas that have been filled and/or are impacted by overloads of upland sediment.

Paradise Creek marshes do not appear to be as impacted as are the marshes of urban creeks in other areas of Portsmouth.

Section VII. Paradise Creek



Section VII. Paradise Creek

#	MARSH LOCATION	TOTAL ACRES	SALTMARSH CORDGRASS	BLACK NEEDLERUSH	SALTMEADOW HAY	SALTBUSH	BIG CORDGRASS	REEDGRASS	CATTAILS	FOXTAIL GRASS	MARSH FLEABANE	MARSH MALLOW	ORACH	SALTMARSH ASTER	SEA OXEYE	WATER HEMP	OBSERVATIONS	MARSH TYPE
81	Paradise Creek	14.50	70	--	5	5		20								--	Large embayed marsh	I
			10.15		.73	.73		2.90										
82	Paradise Creek	2.66	10			10		80									Fringe marsh somewhat embayed	VIII
			.27			.27		2.13										
83	Paradise Creek	42.00	70	2	5	5	10	8			--			--		--	Embayed creek marsh	I
			29.40	.84	2.10	2.10	4.20	3.36										
84	Paradise Creek	2.20	40			20	10	30									Embayed marsh	XII
			.88			.44	.22	.66										
85	Paradise Creek	1.40	60			5		35									Pocket marsh	I
			.84			.07		.49										
86	Paradise Creek	7.57	50			5	25	20									Large embayed marsh	I
			3.79			.38	1.89	1.51										
	Total Section VII	70.33																
			45.33	.84	2.83	3.99	6.31	11.05										
	GRAND TOTAL	422.76																
			331.23	4.56	11.50	21.63	9.82	39.31	.18	.01			.71			3.91		

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